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## Private provision of a public good: cooperation and altruism of Internet forum users

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**Abstract:** We ran an experiment with users of Internet forums. In a dictator game, we find that the level of altruism is positively related to the activity in the forum. In a public good game, there is no relation between cooperation in the game and contribution to the content of the forum. Subjects are not more altruistic with partners from the same forum but do cooperate more with them. These results suggest that the public good provided in Internet forums is mainly provided by a group of unconditional altruistic users, and that the sense of belonging supports the cooperation in that provision.

**Keywords:** Altruism, belonging, cooperation, Internet forums, public good provision

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## 1. Introduction

Millions of people around the world spend a significant part of their lives participating in virtual communities. Since the beginnings of the Internet

(Rheingold 1993), many users have been sharing information and enjoying virtual social relationships with other people. In recent years, social interaction in the Internet through social media like Facebook or Twitter has become a phenomenon of first order importance, but Internet chats and forums have been putting individuals in contact for a long time. In this work we study Internet forums (also called "Internet message boards"), a type of virtual community where people discuss and interact online with each other around a shared interest.

Virtual communities are sustained by the participation of many users who share conversation and make knowledge available. Kollock (1999) studies how an economy of gifts and cooperation enables these communities to be sustained. Importantly, when these communities are open access, the information they provide is a public good which is privately provided through the participation of a wealth of individuals, who receive no monetary contribution for their participation. Hess and Ostrom (2007) point to the commons nature of these communities. The distribution and sharing of information through the new technologies share many important aspects of traditional commons, and can be understood using similar tools (Ostrom and Hess 2007). These communities are able to survive when the users protect and differentiate their community (Bravo 2012), and they develop institutions (rules) that protect their own culture, as in other commons (Ostrom 1990, 2000). In the particular case of Internet forums, although many are privately owned, users feel they are sharing information in a true public good (Wasko and Faraj 2000). The success of these communities relies on motivations and particular characteristics of the individuals who participate in them.

Many recent studies have explored motivations of individuals to participate in these communities, mostly using polls. Motivations vary with the type and particular focus of each virtual community (Ridings and Gefen 2004). According to the uses and gratification theory, the motivations are purposive value, self discovery, maintaining interpersonal connectivity, social enhancement and entertainment (Dholakia et al. 2004). In comparison, organizational commitment theories relate participation with the sense of belonging (Lampe et al. 2010). Using status seeking and self-presentation theories, Lampel and Bhalla (2007) identify altruism and reciprocity as key factors. In the particular case of the Internet forums, Moore and Serva (2007) find that the main motivations for participating are cooperation, altruism and belonging. Bravo (2010) explores why this voluntary contribution emerges in the case of mutual-help forums, and finds that altruistic behavior is the main motivation for the core group of users.

Pro-social behavior is a well documented fact. We refer to altruism as the principle of caring for the welfare of others. Cooperation is the act of participating in common projects whose success depends on the contributions of the participants. These behaviors, which have been found to be motivators for Internet forum participation, are also key explicators of success of commons. The classical question in these situations is why people do not act simply as free riders, which is the behavior expected by the traditional economic approach. Psychological

economics shows that behavioral motivations of real subjects are quite different from simple egoism.

The sense of belonging has been found to be important in reinforcing these behaviors. Several studies find that people tend to favor members of their group (Tajfel and Turner 1979; Brewer and Brown 1998; Hewstone et al. 2002). Individuals value the fact of belonging to a group, and this significantly affects their social and economic behavior (Ben-Ner et al. 2009; Heap and Zizzo 2009) and makes them more altruistic when matched with in-group members (Chen and Li 2009). These effects are potentially important for online communities, which are likely to define a specific identity among their users.

Altruism, tendency to cooperation and in-group/out-group effects have been consistently shown in experiments to be robust. The Dictator game (Kahneman et al. 1986) is a classical economic experiment where individuals are asked to make donations to an unknown partner. The Public good game, on the other hand, proposes a social dilemma situation where people have to decide whether to invest in a common project, in a way that the investment is profitable for the society but harmful for the individual (Marwell and Ames 1981). Management of the commons, in particular, has been extensively studied using variations of the public good game (Ostrom 2006, 2010; Poteete et al. 2010). These experiments have found that individuals consistently behave in an altruistic way (Henrich et al. 2001). When cooperating, the particular characteristics of individuals are a key factor (Ostrom, 2000; Fischbacher et al. 2001). Sense of belonging has been identified in these experiments, for instance, by Ben-Ner et al. (2009).

Although there is wide research on common pool resources dilemmas using an experimental approach, there is little evidence for the relation between laboratory and real life behavior. Some examples are Cardenas (2000), who studies the behavior of users of natural resources in Colombian villages in a common pool resource experiment. Karlan (2005) shows how the Trust game is able to predict real behavior in microcredit takers. Thöni et al. (2012) find that most (69%) of the population are conditional cooperators and that cooperation choices are driven by preferences and beliefs. They also find that survey measures of social capital are significant predictors of cooperation behavior in the Danish population.

In this work, we study experimentally if level of participation in Internet forums is related to altruism, cooperation and sense of belonging. The information publicly available in the Internet forums allows us to know the participation of each user in the community, measured through the number of *Posts* (messages). This is one of the main insights of this research, because we are able to quantify the contribution of different subjects to a real world commons, and relate it to their behavior in an experimental situation. Our hypotheses are that an Internet forum generates a sense of belonging and that the more a user participates in the forum, the more altruistic and cooperative he or she is, following behavior observed in other commons. As far as we know, this is the first study to use the methodology of experimental economics to disentangle the behavior of these users. With this aim, we conducted a dictator and a public good game with a sample of users of

two large Internet forums. We ran the experiment in both communities asking participants to make a gift or to cooperate in the public good with members of the same or of a different community.<sup>1</sup>

When individuals were asked to give part of their endowment (dictator game), we found that more altruistic users (those who give a higher part of their endowment) are those who post more in the forum. Interestingly, there were no significant in-group/out-group effects. This is consistent with an altruistic explanation for the contribution in public goods (Anderson et al. 1998). We relate altruism measured experimentally with the contribution to the real public good provided in the forum.<sup>2</sup>

When individuals were asked to participate in a common project (public good game), we found no relation between participation in the forum and cooperation to the project.<sup>3</sup> However, we found an in-group/out-group effect, meaning that users tend to cooperate more with members of their forum. This suggests that Internet forums really develop a feeling of community that supports the success of common projects.

## 2. Methods

We want to study if users who provide the public good of the content of Internet forums feel themselves likely to establish higher levels of cooperation with other members of the same or of a different community, as well as the relation between their participation in the forum (measured by the number of posts written by the user), and their altruism and tendency to cooperate. With this idea, we ran an experiment in two Spanish forums, whose users were invited to participate.

We proposed them an experiment consisting of two situations.<sup>4</sup> In the first, a Dictator game framed as a gift, the subject had to decide which part of an endowment to give to an anonymous partner. We considered this answer as a measure of altruism. In the second situation, a Public good game, the subject had to decide how much to invest with an anonymous partner. The investment of each individual generated a public good shared equally. We considered this answer as a measure of the tendency to cooperate. Subjects decided under two different treatments: half of the sample was informed that they were playing with individuals from the same forum, and the other half that they were playing with individuals from another forum.

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<sup>1</sup> Some recent studies have shown the validity of virtual laboratories, obtaining results compatible with those in traditional laboratory experiments (Horton et al. 2011; Hergueux and Jacquemet 2014).

<sup>2</sup> Laury and Taylor (2008) found that altruism measured in the lab explained contribution to a real common. They conducted an experiment where individuals faced a dictator game and then had the possibility of contributing to a real public good. The novelty in our study is that we measure the contribution to the real public good through the participation in the forum, which is the result of the daily decisions of the users.

<sup>3</sup> Anderson et al. (2011) also find that cooperation in a public good game explains less participation in a commons than preferences on altruism.

<sup>4</sup> Instructions in Appendix 3.

## 2.1. Experimental subjects

We recruited 200 volunteers from two different Spanish Internet forums, Forocoches.com and Burbuja.info. Forocoches.com (Forum 1 from now on) is probably the most popular Spanish forum. Originally directed toward car users, it has evolved into a general debate forum, where people talk about a wide set of topics. Burbuja.info (Forum 2) is probably the most popular Spanish forum focused on economic topics. Fifty volunteers were recruited on Forum 1 with a thread looking for participation in an experiment that would give the chance to win a prize. This thread was posted on June 27th 2013, and a new thread was posted on July 7th looking for an additional fifty volunteers. In the case of Forum 2, we posted a thread looking for one hundred volunteers on July 8th. In both forums, we were surprised by the high level of responses we received.

## 2.2. Thread

The message in the thread was equal in both forums. Users registered in 2012 or earlier were kindly asked to respond to the thread if they were willing to take part in an experiment in which they would answer a short questionnaire. Making groups of 50 users, each subject was assigned 2 different two-digit numbers, and the one with the same ending numbers as in the First Prize of the following Spanish National Lottery draw would win a prize depending on the answers of the subject and on the answers of others.

In the case of Forum 1, we included in the title of the thread the tag “Serious topic”, which is used when trolling behavior is not allowed, which is usually respected by the users. In the case of Forum 2, the team of moderators warned in our thread that trolling behavior was not allowed.<sup>5</sup>

When users applied for participation, we wrote their names as well as the number assigned for the lottery in the initial post of the thread, so making this information transparent. Next, we sent each participant a private message through the forum including a hyperlink to a Google Form, where they answered seven questions step by step.

## 2.3. Questionnaire

Clicking on the hyperlink took participants to a website where the experiment and the prize were explained once more. They were informed that in the case of winning the lottery, their prize would be €5 (show-up fee) plus an amount depending on the decisions of the user and the rest of participants. After that they were required to introduce their nickname of the Forum. Then, they were presented first with a public good game situation and later with a dictator game,

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<sup>5</sup> We strongly acknowledge the readiness of the users of both forums, as well as the respect they showed throughout the experiment. We also kindly thank the moderator “ransomraff” in Forum 2 for the help provided.

or vice versa, in order to control for order effects. In both cases, the situation was initially explained and the user was asked to continue only if everything had been understood. After clicking, they were allowed to answer.

In the dictator game, framed as a gift situation, the participant was allowed to freely give up to €10 of her/his own potential prize to another unknown participant, different from the one paired in the public good situation. These questions were entitled as “Your gift”. In the public good game, they were asked to freely allocate up to €10 to a project with a random anonymous partner, which had the same option, so each Euro invested would pay €0.75 to both members of the pair. These questions were entitled “Your investment”. In both cases, the part of the money neither given nor invested remained as part of the participant’s prize. Half of participants read that their pairs were members of the same forum, while the other half read that their pairs were members of a different forum (not specified which) where the experiment was also being conducted. Then, subjects were informed that their prize would also be increased by the gift of another random user.

Finally, they had to write how many euro they thought that their random partners had invested and given. We encouraged answers by offering 1 additional euro for each answer of their partner they matched. When all participants completed the experiment, we made random pairs, computed the potential prize for each and posted it in the first message of the thread, next to the nickname of the user and the two different numbers of two digits, which were the equivalent to their lottery tickets.

## 2.4. Potential prizes

Given the rules, the potential prize was theoretically between a minimum of €12.50 (show-up fee, full investment and no investment of the other user, all money given as gift, no money received and failed prediction about the partner behavior) and a maximum of €44.50 (show-up fee, no investment and full investment of the pair, no money given as gift and €10 received, and answering correctly the prize of the partners). In the experiment, the minimum and maximum potential prizes were of €14.50 and €42.50, respectively. The prizes that won the lottery were of €25, €26.50, €28.75 and €30.25. The prizes were given in the form of Amazon Gift Cards.

## 2.5. Variables

We obtained the decisions from each participant in the Google Form and generated the following variables: *Gift* (amount of euros that the subjects gave), *Investment* (amount of euros that the subjects invested), *Belief in Gift* and *Belief in Investment* (beliefs in actions of others).

We also created the variables *Posts*, the number of messages written by the subjects, and *Register*, the months elapsed since the subjects were registered in the forum. This information is publicly displayed in the forum, next to the nickname of each user. With these two variables we controlled for implication and participation of the users in the virtual community.

### 3. Hypotheses

Users of forums spend a significant part of their time reading and writing in them. Participation varies strongly, but there is typically a core group of users who participate very often (Arthur 2006). These users are mainly responsible for generating a public good, the content included in the forum, which many other users can freely enjoy. Why do these users contribute?

We expect that the more active individuals are in the forum, the more altruistic they would be and the more they would cooperate in the public good. We therefore hypothesize:

**H.1.** *Subjects with more posts give and invest more.*

Those individuals registered for a longer time in the forum should be more aware of the fact that they belong to an informal institution in which they are cooperating. This leads to:

**H.2.** *Subjects registered for a longer time invest more.*

Agents should be more altruistic with individuals from the same forum. At the same time, we also expect that subjects are more confident with respect to their forum partners, so the level of investment should be higher when the partner is from the same forum. Accordingly, we propose:

**H.3.** *Subjects give and invest more when partners are from the same forum.*

More active users share a higher part of their time in the community. We expect more participative individuals to trust more in pro-social behavior of the rest of users:

**H.4.** *Subjects with more posts believe that partners will give and invest more.*

Finally, we also expect a group effect in the beliefs on actions of others. We hypothesize that users believe that partners are more likely to give and invest when they are paired with a partner from the same forum:

**H.5.** *Subjects believe that partners give and invest more when they are from the same forum.*

### 4. Results

Our experimental subjects had been registered in the forums for an average of 44 months, with a standard deviation of 24 (2 years) and a median of 41 months. The subject with the oldest forum account had been registered for 9 years and 2 months when we ran the experiment. The average accumulated number of messages was almost 3000, which means that our experimental subjects, on average, had written around 67 messages monthly. This is a measure of how active each user is in the forum, and the data had a large variability, with a maximum of one user with more than 28,000 messages. In Table 1, we present the descriptive statistics of the experiment.

Subjects give and invest a relatively high part of their endowment, €5.09 and €6.69, on average. As expected, and because there is a partial return for the



Table 1: Descriptive statistics.

	Posts	Register	Gift (€)	Investment (€)	Belief in Gift (€)	Belief in Investment (€)
Mean	2966.33	43.94	5.09	6.69	3.73	5.57
Std Dev	4692.43	24.54	3.10	3.19	3.10	3.25
Median	1238	41	5	7	4	5
Max	28,217	110	10	10	10	10
Min	4	7	0	0	0	0

*Posts is the number of messages written by the subjects, and Register is the months elapsed since the subjects registered in the forum. Gift (€) is the quantity of euros that the subjects gave and Investment (€) the quantity of euros that the subjects invested. Belief in Gift (€) and Belief in Investment (€) refer to the beliefs in actions of others.*

subject, the investment is on average higher than the gift, €1.60. Only 14% of the subjects gave more than they invested. They believe, on average, that they have given €1.36 more than their partners and invested €1.12 more. Appendix 1 presents these descriptive statistics disaggregated by forum and depending on whether the pairs were from the same or from another forum.

We observe weak correlations between the different variables (see Table 2). In particular, the relation between Posts and Register is not very strong, and the experimental answers (Gift, Investment and Beliefs) are positively but also weakly related with them.

The correlation is stronger among the answer of each participant. The most relevant correlations occur among the answer of participants in the experiment, and not with respect to the variables related with behavior in the forum. In Figure 1 we plot in a scatter diagram the relation between Gift and Investment, between their beliefs, and between Gift and Investment with their respective beliefs. We observe a weak relation between Gift and Investment, both their own and that predicted by the partner. We observe a stronger relation between the gift of the subject and the users' beliefs about the gift of the partner, and between own investment and the belief in the investment of the partner.

Table 2: Correlation Matrix of main variables.

	Posts	Register	Gift	Investment	Belief in Gift	Belief in Investment
Posts	1					
Register	0.141	1				
Gift	0.115	0.099	1			
Investment	0.024	0.069	0.428	1		
Belief in Gift	0.115	0.063	0.588	0.306	1	
Belief in Investment	0.036	0.107	0.228	0.536	0.163	1



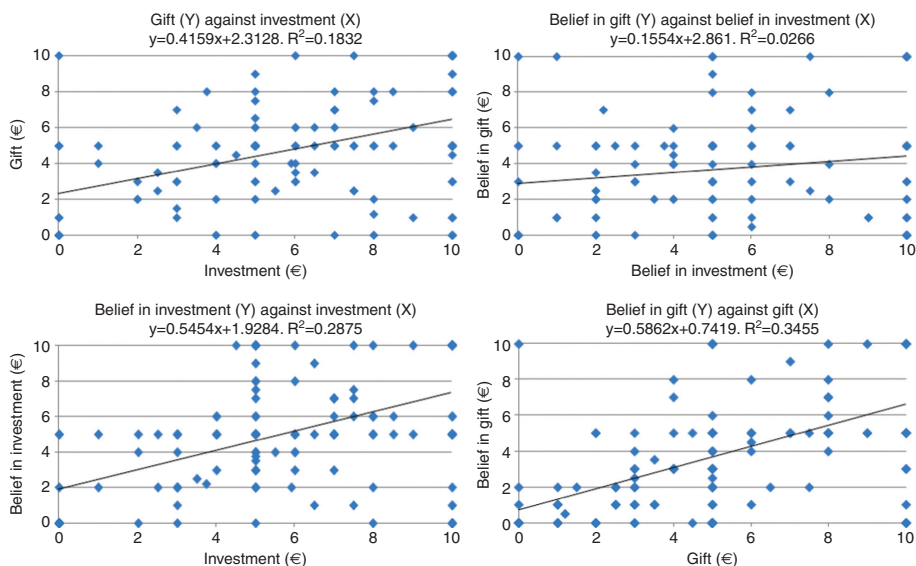


Figure 1: Simple linear regressions. Upper regressions relate gift and investment and the beliefs on gift and investment. Lower regressions relate investment with its belief and gift with its beliefs. Axis in euros.

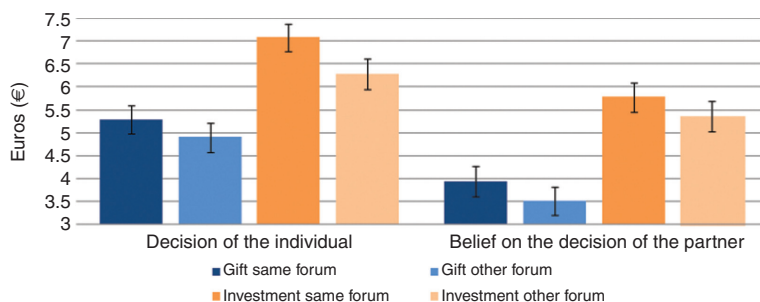


Figure 2: Gift, Investment and Beliefs. On the left, average of decisions when paired with someone from the same/other forum. On the right, average of beliefs about decisions when paired with someone from the same/other forum. Quantities in euros.

We find a difference in decisions between the same and a different forum in all cases. As can be observed in Figure 2, individuals gave and invested less when the partner was from another forum. Consistent with this, we also observe that beliefs in actions of the partner are systematically lower when the partner is from another forum. In Figure 2 we plot the mean of each decision, with the associated standard errors. Although the difference between a partner from the same forum

and from a different one is systematic, we point out that it is significant only in the case of investment.

In order to clarify whether decisions of gift and investment can be explained by the experience of each subject in the forum, we ran a regression analysis. We explore using OLS if the level of Gift and Investment can be explained by the level of participation of the subject (*Posts*, in thousands) and the time the subject was registered in the forum (*Register*, in months). Moreover, we include in this regression three dummy variables. *Forum 1* takes value 1 if the participant belongs to Forum 1 (0 otherwise), and we use it to capture forum-specific conditions. *Belonging* takes value 1 when the subject plays with a partner from the same forum. *Order* takes value 1 when the participant answers the dictator game first.

In Table 2 we report the results of these regressions in Models (1) and (3). Models (2) and (4) include as explanatory variable the belief of the subject on the action of the associated partner. For each model we report the coefficients of the initial regression on the left and those coefficients that survive after removing the non significant ones on the right.

When we include beliefs about actions of the partner as explanatory, the model increases its explanatory power importantly (adjusted  $R^2$  is multiplied by 7 or more). However, we consider that we measure very closed concepts when we use the actions of the subject and their beliefs about actions of the partner; second, we asked their opinions immediately after their decisions, so using these beliefs as exogenous in the explanation of own decisions is not totally sensible. In fact, when we do, the beliefs eliminate any possible explanatory power of the rest of variables.

When we focus our attention on the models that exclude beliefs, we do not find evidence for a high level of cooperation in the public good game among more active subjects of the forums or between users who were registered for a longer time, so we only accept the first part (related to giving) of Hypothesis 1 and we reject Hypothesis 2. We do find evidence of a higher altruism of these more active subjects. We find each 1000 posts in the forum implies a gift of 8 cents higher, and that for each month registered in the forum, subjects give 1.6 cents more (19.2 cents for each year). This supports the hypothesis of a higher level of altruism of those subjects that form the core of the subjects in the forum. In the case of Investment, we find that members of Forum 1 invested significantly more. More importantly, participants invested more when their partner was from the same forum, which points to the existence of a sense of belonging when cooperating. However, we do not find group effects when giving. Accordingly, we accept Hypothesis 3 and therefore obtain the following results:

**R1. *More active Internet forum subjects are more altruistic but do not tend to cooperate more.***

**R2. *Subjects participating in Internet forums for a longer time are more altruistic. However, they do not tend to cooperate more.***

**R3. *Subjects in Internet forums are not more generous with participants from the same forum, so they are not conditionally altruist. They have a higher level of confidence in their community, so they invest more with their partners.***

We also note that there is an order effect in our data that affected the level of altruism. Subjects who decided initially in the public good game were later more likely to give to an unknown partner than those who decided about the gift first. We find that explanatory power of these models is in general very low, represented by a low  $R^2$ , indicating that there are other factors that we did not take into account in our study.

It is possible that in both communities Posts and Register have different meanings, i.e., the sense of belonging could differ between communities. However, if we intersect Register and Posts with Forum 1 and Belonging, the intersected variables are not significant in any regression (see Appendix 2). This suggests that a high level of Posts and a longer Register imply similar behaviors in both forums.

Finally, in Table 3 we explore the beliefs of the participants about the actions of others. Although the own answer of the subject to the dictator and the public good game is likely to frame the beliefs, we believe that the answer of a subject can really provide sensible information about the beliefs about others, since it was a question that carried a reward.

Table 3: Regression analysis models.

	Gift				Investment			
	(1)		(2)		(3)		(4)	
Posts	0.078 <i>0.048</i>	<b>0.083*</b> <i>0.046</i>	0.031 <i>0.04</i>		0.011 <i>0.05</i>		-0.004 <i>0.043</i>	
Register	0.015 <i>0.009</i>	<b>0.016*</b> <i>0.008</i>	0.009 <i>0.008</i>		0.005 <i>0.01</i>		0.000 <i>0.008</i>	
Belief on Gift			<b>0.559***</b>	<b>0.589***</b>				
			<i>0.06</i>	<i>0.058</i>				
Belief on Investment							<b>0.515***</b>	<b>0.527***</b>
							<i>0.061</i>	<i>0.059</i>
Belonging	0.209 <i>0.438</i>		0.363 <i>0.365</i>		0.743 <i>0.459</i>	<b>0.792*</b> <i>0.446</i>	0.581 <i>0.393</i>	
Forum 1	0.215 <i>0.441</i>		0.14 <i>0.367</i>		<b>0.846*</b> <i>0.463</i>	<b>0.842*</b> <i>0.446</i>	0.274 <i>0.401</i>	
Order	<b>1.363***</b> <i>0.441</i>	<b>1.380***</b> <i>0.438</i>	0.604 <i>0.375</i>		0.078 <i>0.462</i>		0.135 <i>0.395</i>	
Constant	<b>4.898***</b> <i>0.554</i>	<b>4.839***</b> <i>0.466</i>	<b>2.858***</b> <i>0.51</i>	<b>2.896***</b> <i>0.279</i>	<b>6.573***</b> <i>0.573</i>	<b>6.711***</b> <i>0.387</i>	<b>3.757***</b> <i>0.597</i>	<b>3.747***</b> <i>0.38</i>
F	2.9	4.72	18.11	104.53	1.39	3.35	13.64	79.88
P-Value F	0.0151	0.003	0.000	0.000	0.23	0.037	0.000	0.000
R <sup>2</sup>	0.0695	0.067	0.36	0.346	0.035	0.033	0.298	0.288
Adj R <sup>2</sup>	0.0456	0.053	0.34	0.342	0.01	0.023	0.276	0.284

(1) Regress gift over explanatory variables excluding beliefs, (2) includes beliefs. (1) Regress investment over explanatory variables excluding beliefs, (2) includes beliefs. For each model, on the left is the complete model and on the right only with significant regressors. Estimated coefficients over standard deviation (in italics). Coefficients are significant at 10% (\*), 5% (\*\*) or 1% (\*\*\*).  $n=200$ .

We find that more active subjects believe that others are more altruistic, while this is not true for individuals who had been registered for a longer time (see Table 4). This is consistent with more active individuals having a nicer view of their partners in the forums, while it is not necessarily true for participants registered for a longer time.

However, we find that beliefs about the investment of the partner do not differ depending on Posts or Register, as expected after observing that these variables did not affect investment decisions. This shows that neither individuals with a longer history in the forum nor more active subjects have higher levels of confidence in others.

**R.4. Subjects registered for a longer time believe their partners will neither give nor invest more. More active subjects believe that their partners are more altruistic, but do not believe that their partners invest more.**

Finally, we do not find any significance of Belonging explaining the beliefs. This suggests that individuals do not believe that belonging to the same forum would change the actions of the partner.

Table 4: Regressions using Belief in Gift and Belief in Investment as dependent variable.

	Belief in Gift				Belief in Investment			
	(1)	(2)	(3)	(4)	(3)	(4)	(3)	(4)
<b>Posts</b>	<b>0.082*</b> <i>0.048</i>	<b>0.093**</b> <i>0.046</i>	0.039 <i>0.04</i>		-0.013 <i>0.051</i>		-0.008 <i>0.043</i>	
<b>Register</b>	0.01 <i>0.009</i>		0.001 <i>0.008</i>		0.011 <i>0.01</i>		0.008 <i>0.008</i>	
<b>Gift</b>			<b>0.559***</b> <i>0.0597</i>	<b>0.586***</b> <i>0.057</i>				
<b>Investment</b>							<b>0.529***</b> <i>0.062</i>	<b>0.531***</b> <i>0.061</i>
<b>Belonging</b>	0.309 <i>0.438</i>		0.192 <i>0.364</i>		0.316 <i>0.465</i>		-0.078 <i>0.401</i>	
<b>Forum 1</b>	0.134 <i>0.441</i>		0.0136 <i>0.367</i>		<b>1.109**</b> <i>0.469</i>	<b>1.12**</b> <i>0.454</i>	0.662 <i>0.404</i>	<b>0.672*</b> <i>0.39</i>
<b>Order</b>	<b>1.357***</b> <i>0.44</i>	<b>1.275***</b> <i>0.431</i>	0.596 <i>0.375</i>		0.112 <i>0.468</i>		0.153 <i>0.4</i>	
<b>Constant</b>	<b>3.647***</b> <i>0.554</i>	<b>4.09***</b> <i>0.321</i>	<b>0.911*</b> <i>0.545</i>	<b>0.742**</b> <i>0.432</i>	<b>5.465***</b> <i>0.589</i>	<b>6.135***</b> <i>0.321</i>	<b>1.987***</b> <i>0.649</i>	<b>2.358***</b> <i>0.514</i>
<b>F</b>	2.71	5.75	17.89	104.53	1.68	6.09	13.97	41.82
<b>P-Value F</b>	0.022	0.004	0.000	0.000	0.141	0.015	0.000	0.000
<b>R2</b>	0.065	0.055	0.357	0.346	0.042	0.03	0.303	0.298
<b>Adj R2</b>	0.041	0.046	0.337	0.342	0.017	0.025	0.281	0.291

(1) Regress Belief in Gift over explanatory variables excluding Gift, (2) includes Gift. (3) Regress Belief in Investment over explanatory variables excluding Investment, (4) includes Investment. For each model, on the left is the complete model and on the right only with significant regressors. Estimated coefficients over standard deviation (in italics). Coefficients are significant at 10% (\*), 5% (\*\*) or 1% (\*\*\*).  $n=200$ .

**R.5. Subjects do not believe that others will behave differently if they belong to the same forum.**

*Groups of individuals and forum content provision.*

Up to now we have found that posts (provision of the real public good) are correlated with altruism but not with the cooperation level in the public good game. An interesting question is whether this is caused by a particular group of individuals. Experimental research on the commons has identified the existence of different groups of users. Fischbacher et al. (2001), for instance, classify individuals as selfish, altruistic or conditionally cooperative, depending on their reactions in iterated interactions with respect to a public good. Ostrom (2000) includes willing punishers as individuals important in sustaining the provision of a commons. We do not study repetitions of our games, but we are also interested in exploring the existence of different groups of individuals, depending on their actions and on their beliefs with respect to the others.

We study the behavior of “extreme” individuals in Figure 3. We call “extreme individuals” those who give or invest everything or nothing. As Figure 3 shows, there is a strong difference between the level of participation in the forum between those subjects who gave nothing and a positive amount, and it also exists between those who invested “0” or a positive amount, although differences in this case are smaller. However, there are no differences between those who gave or invested everything and the rest of participants.

This suggests that it is not a matter of being a rational egoist which drives the non cooperation in a real public good. We observe that the main difference in Posts correspond to subjects who gave nothing, who write much fewer posts. This also occurs with individuals who invested nothing, but differences are not so strong. That is, the least altruistic participants in the dictator game are clearly those who provide the commons less content of the forum than the rest of individuals.

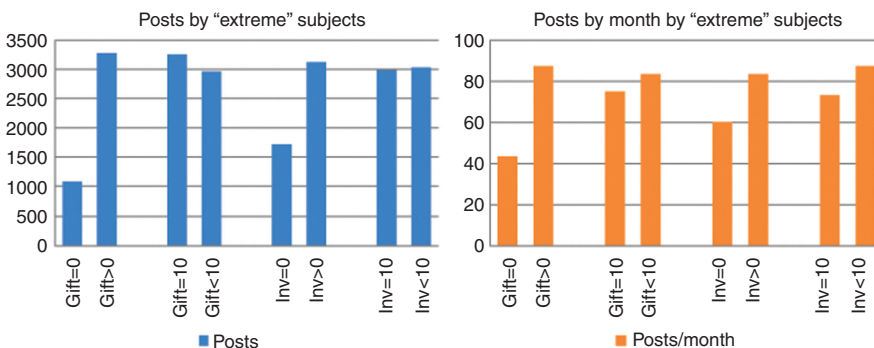


Figure 3: Posts and posts by month by subjects who give or invest nothing or everything in the experiment, against the rest of subjects.

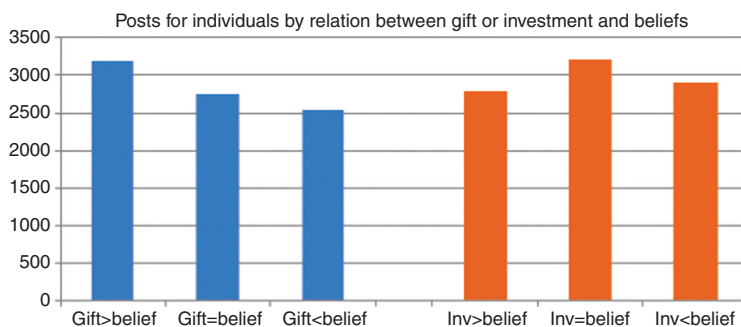


Figure 4: Average number of posts of subjects with a gift or investment higher/equal/lower than the belief on the decision of the partner.

We also want to study if the individuals who contribute more or less to the forum believe that the rest of subjects are more or less altruistic or cooperative than themselves. As Figure 4 shows, this is not the case. We have separated individuals into three groups, those who believe that they give/cooperate more/equal/less than the partner. There are no relevant differences between those individuals. This suggests that self consideration as more or less altruistic or cooperative than a potential partner is not related with the own provision to the content of the forum.

## 5. Discussion

Our study shows the relation between provision of a real public good and behavior in an experimental environment. Some new commons, as is the case of Internet forums, allow us to identify how much the user contributes to the provision of the public good. Therefore, it is feasible to study the personal characteristics of those individuals who contribute most and the conditions that help the provision of commons. As far as we know, Algan et al. (2013) is the only study that explores a similar question, but with respect to the provision of Wikipedia.<sup>6</sup> They relate contributions of Wikipedia users with their behavior in some standard experiments, using a dictator and a public good game among others. They find a positive relation between provision of Wikipedia content and cooperation in the public good game, and no relation between altruism in the dictator game and provision of content. These results are contrary to ours, suggesting that people who contribute to Wikipedia are quite different from those who provide discussions in Internet forums.

<sup>6</sup> Wikipedia is probably the most studied new common. Forte and Bruckman (2005) and Wagner and Prasarnphanich (2007), for instance, focus on the motivation to write in it. Another relevant example is Zhang and Zhu (2011), who find in a natural experiment that people contribute more to Wikipedia because of the social impact of the contributions, thus explaining why contribution increases when users of the public good increase. A recent study shows that group size has nonlinear effects, with an optimal intermediate size (Yang et al. 2013).

Due to the financial restriction we had in the experiment, we used weak incentives for the participants. Increasing the incentives, for instance providing the monetary prize directly and not through lottery participation, would shed light on whether the effects described here increase or remain at the same level when incentives are higher. It would also be interesting to extend the analysis to users of different forums. This would allow a multi-level analysis, which would identify the existence of forum and not only individual effects. It could be also important to study dynamic interactions by analyzing the existence of different group trends.<sup>7</sup>

Finally, it is important to point out that we must be cautious with the generalization of the results. Our sample is limited, because we asked for subjects who had been registered in the forums for at least 6 months, so it is not a representative sample of forum users, although it can be considered as a sample of “experienced users”. This is also the case because the number of posts of subjects in our sample, with an average of almost 3000 posts looks high. Moreover, we asked for just 200 volunteers, from among the first users, so our sample may also be biased because it is formed by individuals who are more likely to participate and to write in the forum quickly (as occurs in other studies such as Lampe et al. 2010). All these together may mean our sample is overrepresented by forum users who participate more and our results describe better these individuals, who in fact are the core generators of the content of the forums.

## 6. Conclusion

Users of Internet forums generate a public good when they provide free content that can be accessed by other users. We ran an experiment to study altruism and cooperation between forum users, as well as how belonging to a community determines these behaviors.

Previous studies on how the public good provided by forum users is generated (Bravo 2010) have approached the issue of motivations. Ours is the first study to explore whether altruism and cooperation, as measured usually in experimental economics, are related to the provision of such a public good. We find that the subjects who contribute most to the forum have a higher level of altruism and believe also that other individuals are more altruistic. However, those individuals who are most active in the forum do not tend to cooperate more in a public good experiment. These results suggest that one relevant explanation of the success of Internet forums is the existence of a core group of altruistic users.

We also find evidence for a feeling of community inside the forums. Although altruism of the participants is not conditioned on being directed to members of their own community, sense of belonging makes them more likely to cooperate with partners from the same forum. Therefore, building this type of identity also seems important for the success of the forum in the provision of its public good.

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<sup>7</sup> This would allow a multi-level analysis, which was not feasible in our case since individuals interacted once and given that we had users of only two forums.



When we separate individuals by groups, we find that the main difference in forum posts provision occurs for those individuals who gave nothing in the dictator game. We find that differences in self consideration with respect to others do not explain the provision of the forum.

This experiment sheds light on how Internet forums work and continuously provide a completely privately generated public good. We expect in the future to make a more detailed and general study of the behavior of Internet forums, using other standardized experimental methods.

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## Appendix I

Here we present the descriptive statistics of each subgroup:

*Table I. Forum 1. Partners of Same Forum.*

	Post	Register	Gift	Investment	Belief in Gift	Belief in Investment
Mean	4518.26	55.42	5.54	7.54	4.22	6.38
Std Dev	7007.99	27.43	2.97	2.34	3.23	3.08
Median	1216	55	5	7.5	5	5
Max	28217	110	10	10	10	10
Min	53	11	0	3	0	0

*Table II. Forum 1. Partners of Other Forum.*

	Post	Register	Gift	Investment	Belief in Gift	Belief in Investment
Mean	3572.18	35.94	5.08	6.67	3.58	5.89
Std Dev	4680.91	22.63	3.13	3.30	3.06	3.19
Median	1930.5	30	5	7	4	5
Max	20154	104	10	10	10	10
Min	19	7	0	0	0	0

*Table III. Forum 2. Partners of Same Forum.*

	Post	Register	Gift	Investment	Belief in Gift	Belief in Investment
Mean	1795.20	42.22	5.03	6.62	3.67	5.19
Std Dev	2377.93	23.37	3.44	3.55	3.17	3.24
Median	848.5	39	5	7.75	4	5
Max	13429	90	10	10	10	10
Min	4	8	0	0	0	0

*Table IV. Forum 2. Partners of Other Forum.*

	Post	Register	Gift	Investment	Belief in Gift	Belief in Investment
Mean	1979.66	42.18	4.72	5.91	3.44	4.84
Std Dev	2742.49	20.72	2.89	3.33	2.94	3.35
Median	1001.5	45	5	5	3	5
Max	13668	80	10	10	10	10
Min	7	8	0	0	0	0

## Appendix 2

Regressions where we intersect Posts and Register with Forum 1 and Own:

	Gift		Investment	
Posts	0.117 <i>0.09</i>	<b>0.083*</b> <i>0.046</i>	0.075 <i>0.094</i>	
Register	0.025 <i>0.169</i>	<b>0.016*</b> <i>0.008</i>	0.011 <i>0.018</i>	
Belonging	1.056 <i>1.102</i>		1.51 <i>1.154</i>	<b>0.792*</b> <i>0.449</i>
Forum 1	-0.303 <i>0.992</i>		-0.37 <i>1.039</i>	
Order	<b>-1.329***</b> <i>0.451</i>	<b>-1.380***</b> <i>0.438</i>	-0.064 <i>0.473</i>	
BelongingXRegister	-0.015 <i>0.926</i>		-0.006 <i>0.02</i>	
BelongingXPosts	-0.078 <i>0.104</i>		-0.134 <i>0.109</i>	
ForumXPosts	0.058 <i>0.135</i>		-0.007 <i>0.141</i>	
ForumXRegister	-0.003 <i>0.189</i>		-0.008 <i>0.02</i>	
ForumXBelonging	0.057 <i>0.926</i>		-0.301 <i>0.97</i>	
Constant	<b>4.443***</b> <i>0.79</i>	<b>4.839***</b> <i>0.466</i>	<b>6.032***</b> <i>0.827</i>	<b>6.29***</b> <i>0.318</i>
n	200	200	200	200
F	1.61	4.72	0.89	3.1
P-Value F	0.106	0.003	0.542	0.08
R <sup>2</sup>	0.079	0.067	0.045	0.015
Adj R <sup>2</sup>	0.03	0.053	-0.005	0.011

## Appendix 3

### Initial thread

We reproduce here, in English, the initial message posted on the thread where we were recruiting volunteers and where we posted the prizes. Original threads (in Spanish) can be visited in Forocoches.com (first thread: <http://goo.gl/EzK7Ao>; second thread: <http://goo.gl/oFZEVv>) and in Burbuja.info (<http://goo.gl/pdtSy2>).

**Title:** Collaborate in an experiment and participate in a lottery (2012 accounts or before) (serious topic)

**Message:** Good morning mates,

I would like you help me with a small experiment. Among the 50 participants I will give a prize of a minimum of 5 and a maximum of 42.5 Euros, depending on your decisions, and that the winner will receive with an Amazon Gift Card.

The process will be as follows:

1. If you want to participate, ask it by answering this thread, and I will do a list editing this message with all of you, ordered by time. Only users with accounts from 2012 or before are allowed to participate.
2. Once the inscription process finishes, every participant (the first 50 people) will receive 2 correlative numbers (the numbers 00 and 01 for the first one, the numbers 02 and 03 for the second one... and so on).
3. I will send a private message to each participant with a hyperlink, in order to fill a questionnaire, only with 6 short questions (2–3 min).
4. When everyone answers, I will calculate the prize that everyone may win and I will post it in this message.
5. The prize that each one may obtain will be posted before the day of the lottery. The person with the two last digits of the first prize of the Spanish National Lottery on the next Saturday [date] will be the winner, and I will contact her/him in order to give her/him the gift card.

The prize will depend on the decisions you take and that will be detailed in the questionnaire.

Finally, make it clear that we will not distribute any private information.

Thank you very much for your attention and ¡good luck!

P.D. - Remember that only the first 50 people will participate.

### **Private message**

Participants received a hyperlink to a Google Form. An example of the private message received by each user follows:

**Title:** Experiment and lottery

**Message:** Good morning,

I give you the hyperlink to the questionnaire and lottery, in order to fill it:

[Hyperlink]

Thank you very much for your participation

### **Questionnaire**

There were eight different forms, depending on: the message board of the subject; if her/his partners were of the same/different forum; if the user answered first the public game or the dictator game. An example of the questionnaires (in Spanish) can be visited here: <http://goo.gl/J1Cg2>

We reproduce now the screens observed by each subject:

## FIRST SCREEN:

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Experiment

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\*Compulsory

**Welcome!**

Thank you very much for your participation. As you know, you have received two numbers that will allow you to be able to win a prize if the two last digits of the first prize of the National Lottery next Saturday [DATE] coincide with your numbers. If you win, the prize will be of 5 Euros plus an additional money that will depend on your decisions and on decisions of other participants. The prize will be given with an Amazon Gift Card. In the experiment are also participating users from a message board different from [Message board of the subject]. We are going to assign you random pairs among the participants of the other message board, such that your decisions will affect the final prize you will opt.

*Please, introduce your nickname. \**

*This question is compulsory.*

**Continue**

## SECOND SCREEN:

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Experiment

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\*Compulsory

**Your gift**

Now you will be assigned a random participant from a message board different from [Message board of the subject]. You have 10 Euros to decide how many you want to give to this random mate. The money you give him will increase her/his prize if she/he is the winner. The money you do not give will remain as part as your prize. The only connection between the individual you are paired and you will be the gift that you send her/him. If you have understood how this works, click to continue.

**Back - Continue**

## THIRD SCREEN:

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Experiment

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\*Compulsory

**Your gift**

Remember, each euro you give will go to your mate of the message board different from yours. Each euro you do not give will remain as part of your prize if you are the winner.

*Introduce the amount of money you want to give, from 0 to 10 Euros. You can introduce decimal numbers. \**

*This question is compulsory.*

**Back - Continue**



## FOURTH SCREEN:

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Experiment

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\*Compulsory

**Your investment**

You and another participant, from the message board different from [Message board of the subject], and different from the previous participant you were paired, that will be assigned to you at random, have 10 Euros each one in order to decide how much to invest. The money that both of you decide to invest will multiply by 1.5 and will be split equally among both of you. That is, for each euro that you decide to invest, 0.75 cents will come back to you and 0.75 cents will be received by your random partner. The money that you do not invest will be yours. If you have understood correctly, click to decide.

[Back - Continue](#)

## FIFTH SCREEN:

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Experiment

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\*Compulsory

**Your investment**

Remember, for each euro you invest, 0.75 will come back to you and 0.75 Euros will go to your mate from the message board different to [Message Board of the subject], and the same will occur with her/his investment.

Introduce your Money to invest, from 0 to 10 Euros. You can introduce decimal numbers. \*

This question is compulsory.

[Back - Continue](#)

## SIXTH SCREEN:

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Experiment

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**WARNING**

Your potential prize will be increased also by the gift from a random participant, from the message board different to [Message board of the participant], and different to that participant that will receive your gift. Soon, and previous to the date of the Lottery, we will edit in the thread we opened in the forum the potential prizes for each one of you, once all participants have taken their decisions.

[Back - Continue](#)

## SEVENTH SCREEN:

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Experiment

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\*Compulsory

**Final Questionnaire**

We have almost finished. Now we would want you answer a short questionnaire.

How many Euros do you believe that your mate has invested? \*

If you match it, your prize will be increased in 1 additional euro:

This question is compulsory.

How many Euros do you believe that has given the mate that will increase your prize? \*

If you match it, your prize will be increased in 1 additional euro:

This question is compulsory.

Do you participate in other internet boards? Which ones? \*

This question is compulsory.

How many messages have you approximately posted in those boards? \*

If you do not participate in other boards, just write "No".

This question is compulsory.

**Back - Continue**